The Canadian Entomologist

VOL. LIV. ORILLIA, AUGUST, 1922. No. 8

POPULAR AND PRACTICAL ENTOMOLOGY

OCCURRENCE AND CONTROL OF THE CORN EAR WORM IN ALFALFA.*

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Occurrence.—During the season of 1921, over the central states, the corn ear worm (*Heliothis obsoleta* Fabr.) was generally more abundant than for many years. Late in the season it had become a very serious pest indeed to the various commonly attacked food plants but was especially destructive in young alfalfa fields. This latter habit, while commonly observed in the western country, especially the southwest, can be considered rare for the east central states, especially the northern portion. It was with considerable surprise then that larvae of this species were observed as many as thirty or forty to the square yard in young alfalfa fields and also in fall sown rye.

Such an infestation occurred in a young alfalfa field near St. Joseph, Michigan, and at the time observed, October 3, practically every leaf had been stripped from the young plants. The bare stems remaining caused the field to look at first glance like a clean stubble field. As the injured plants attempted to put out new leaves, half a dozen hungry worms were found waiting to devour each new bud. At least 99 per cent. of these larvae were of this species, there being an occasional fall army worm (*Laphygma frugiperda* Sm. & Abb.) and rarely a velvety specimen of the cotton cut worm (*Prodenia ornithogalli* Guen.)

Control—One batch of poison bran mash made up of 25 lbs. of bran, ¾ lb. Paris green, 2 quarts molasses and about 3 gallons of water was mixed and applied to 5 acres, the remainder of the field being used for a check. The mash was scattered at noon of October 3 and the early afternoon was clear though cool. At 5 o'clock it began to rain, rained all night and was raining at 11 a.m. on the 4th when the experiment was first examined. At this time on the treated area, practically every worm, regardless of the rain, was lying either curled or extended on the ground and 75 per cent. of them were dead. On the check plot not a single worm was on the ground. All of them were crawling about on the alfalfa stems either in search of food or most probably to keep out of the water on the ground caused by the falling rain.

This cool rainy period was followed by warm sunshiny weather and the larvae which survived the first treatment, even though a small per cent. of the extremely heavy original infestation, were able to threaten some damage to certain portions of the field. Therefore, a week after the first treatment, it was decided to treat some portions of the field a second time, including that portion left as a check on the first treatment. Unfortunately, the second application

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met with the same fate as the first: a continuous rain having set in the evening of the day the poison was applied. However, the results were very good indeed, and comparatively few worms survived the second treatment

Conclusion—Immediately after the second treatment the young alfalfa plants began putting out new buds and later growth enabled them to go into winter in fair shape. Larvae which were taken to be *H. obsoleta* and *L. frugiperda* were reared and the adults thus obtained were later determined by Dr. Dyar as the respective species to which they had been assigned.

Considering the unexpected and extremely unfavorable conditions of these experiments, the success of the control obtained is rather remarkable. Good results were obtained under very adverse conditions and given a fair chance, control of the corn ear worm in young alfalfa can be very likely secured by a single thorough application of poison bran mash.

NEW COLEOPTERA, X.

BY H. C. FALL,

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Among a number of species of Coleoptera recently collected at Baldur, Manitoba, by Mr. Norman Criddle and sent me for identification, occurred the following: *Bembidion scudderi* Hawyd, *B henshawi* Hawyd., *B. salinarium* Csy., *Tachys vittiger* Lec., and *Anthicus californicus* Laf. The fact is mentioned to call attention to the very considerable extension of the known range of these species. This is most notable in the case of *T. vittiger*, which has hitherto been recorded only from the Pacific Coast line; I have however specimens from the Salton Sea in the Colorado Desert of California. All the other species mentioned above are known to frequent the alkaline flats of the Salt Lake region in Utah, and their occurrence in Manitoba is at once a commentary on the physical character of the country where they were found. Mr. Criddle has since informed me that they were taken on the shore of a large alkaline pond.

Two other species of *Bembidion* taken by Mr. Criddle on the shores of this same pond will probably prove to be partial if not peculiar to such situations. One of these considerably resembles, and is evidently allied to, *B. constrictum* Say, so common along the Atlantic sea coast, and may be Casey's *sociale* or *particeps*, though not conforming entirely to the description of either. The other appears to be an undescribed species belonging to the small tripunctate group, and allied rather closely to *henshawi*, with which it may be compared as follows.

Bembidion obtusidens n. sp.

Color precisely as in *henshawi*, viz., head and thorax black with distinct green bronze lustre; elytra pale testaceous, each with a small dot or fuscous spot in the position of the first and third dorsal punctures, and between them a larger transverse spot more or less lunate or semicircular in form; body beneath black, slightly greenish, legs rufotestaceous. The size is larger and the form notably broader and less parallel than in *henshawi*; the thorax is nearly

similar in outline, but a little more transverse; the elytra relatively broader, and more shining than is the rule in *henshawi*, though with a detectable alutaceous sculpture. In *henshawi* the mentum tooth is triangular, in the present species broadly arcuate or arcuato-truncate. Length 5 to 6 mm., width, 2.05 to 2.35 mm.

The type is a male collected by Mr. Norman Criddle at Baldur, Manitoba. I have also examples from Aweme, Manitoba; Laramie, Wyoming; and Lagoon, Utah.

It seems not to have been noticed that the name *Bembidion grandiceps* Haywd., covers two quite different forms. These are both present in the Le Conte and Horn collections, and though not recognized as such by Hayward, I believe them to be specifically distinct. In the true *grandiceps* the head and thorax are larger and relatively wider, and the posteriorly oblique sides of the thorax almost attain the angles, the latter being scarcely right, with the sides before them subparallel for an extremely short distance. The type, as indicated by Hayward, is in the Horn collection, and Dr. Skinner writes me that it bears the state label "Tex.," with the name label in Hayward's hand. In the Le Conte collection there are two "Tex." specimens, and a third, the one on the label, bears a yellow locality disk, indicating that it was taken in the central Mississippi Valley (Illinois?). In my own collection are two examples from Berryton, Kansas.

The other form may be described in a few words as follows.

Bembidion rolandi n. sp.

Similar in nearly all respects to *grandiceps*, but distinguished at once by the relatively smaller and more elongate head and thorax, the sides of the latter straight, and parallel at the hind angles for a distance greater than one-sixth the entire basal width, the angles sharply rectangular or extremely nearly so. This species is, so far as I am aware, confined to the Atlantic slope, specimens having been seen from New York (Ithaca), eastern Pennsylvania, and the District of Columbia. The type is from "E. Park" Penn., a suburb of Phila.

Bembidion semiaureum n. sp.

This name is proposed for a very large form of the *fuscicrus* type which has stood for years in my collection awaiting in vain the possible advent of intermediates which might connect it with the latter species. The color is nearly as in *fuscicrus*, viz.—head and thorax greenish black, polished; elytra testaceous with an oval fuscous discal spot which begins at the anterior dorsal puncture and extends somewhat to the rear of the posterior puncture; it is limited laterally at the fifth stria, and continued to base by a rather broad parallel sutural stripe, which involves the first two interspaces. There is no indication of a lateral extension of the fuscous spot, as is frequently the case in *fuscicrus*. The body beneath is black, legs entirely rufotestaceous. The prothorax is rather less narrowed behind than in *fuscicrus*, the base being only just perceptibly narrower than the apex. Length 6.2 to 7 mm.

Humboldt Co., California (Van Dyke).

Fuscicrus is a conspicuously smaller and somewhat narrower species, rarely much exceeding 5 mm. in length, the thorax smaller and more narrowed basally, the fuscous elytral spot smaller, with manifest tendency to be extended laterally, even in some cases to the side margins; the hind femora often more or less piceous. Specimens in my collection from Ft. Yukon and Rampart, Alaska, are undoubtedly Mannerheim's *lucidum* var. b.," to which Motschulsky gave the name *fuscicrus*, and are, moreover, quite inseparable from Wyoming and Colorado specimens at hand, to which the names *caducum*, *albidipenne* and perhaps others of Casey's recent Revision are applicable.

Two undescribed specimens of *Dyschirius* have been sent me from Manitoba by Mr. Criddle and Mr. Wallis, one of which was taken at Baldur on the shores of the alkaline pond already referred to. These may be described as follows.

Dyschirius interior n. sp.

Closely allied to the Californian *tridentatus* Lec., with which it must be associated because of the wide elytra margined at base, and the clypeus tridentate. The form is very distinctly narrower than in *tridentatus*, the legs rufous instead of nearly black, and the prothorax, elytral apex and body beneath show a more or less marked rufescence, the general color, however, being black with green bronze lustre. The front is transversely sulcate, the frontal crest nearly wanting. The third elytral interspace is tripunctate, all three punctures lying near the third stria. The apical protibial process is here a little longer than the terminal spur, while in *tridentatus* the reverse condition seems to prevail. Length 3.7 to 3.8 mm.

Four examples have been seen, all taken at Baldur, Manitoba by Messrs. Norman Criddle, J. B. Wallis, and L. W. Roberts.

Aside from *tridentatus*, the only other species in our fauna having the base of the elytra margined, the clypeus tridentate, and the third elytral interval tripunctate, is the Californian *varidens* Fall, a considerably smaller species (2.7 to 3 mm.) with more finely striate elytra.

Dyschirius perversus n. sp.

Elongate, parallel, thorax nearly as long as wide, feebly narrowed in front and scarcely perceptibly narrower than the elytra; color black with green bronze lustre, legs rufous. Front transversely impressed; elytral striae entire, finely but distinctly impressed except at the extreme base; striae moderately punctate; third interspace bipunctate, the first puncture near the base and virtually on the third stria, the other near the third stria at about the apical fifth. Front tibae subedentate externally. Length 4.8 mm; width 1.3 mm.

Described from a single example submitted by Mr. J. B. Wallis and bearing label, Miami, Manitoba, 16—VI—17.

By Le Conte's table (Bull. Brook. Ent. Soc. 1879) this species falls with *sphaericollis* and *edentulus*. *Sphaericollis* is larger, with a more transverse thorax and generally stouter form, and in it, as in its associates, it is the basal puncture of the third interspace that is lacking rather than the intermediate one. *Edentulus* is, I think, unknown to American students; at any rate its very large size—7 mm.—is sufficient to exclude it.

Listrochelus longiclavus n. sp.

Rather stout, oblong oval, a little broader behind, entirely rufotestaceous, the head and thorax with sparse erect hairs, elytra glabrous. Head densely punctate, the clypeus less densely so; clypeal margin broadly reflexed, arcuato-truncate, the angles rounded. Prothorax three-fifths as long as wide, sides nearly straight and parallel in basal two thirds, thence strongly convergent to apex, side margins barely perceptibly crenulate; surface uniformly punctate, the punctures distant on an average by their own diameters. Elytra slightly rugose and rather closely punctate. Length 11.3 to 12.3 mm.

Male.— Antennal club very elongate, nearly twice as long as the stem; ventral surface flattened, the sixth segment and the median parts of the fifth except at base, closely punctate; tarsi very slender, much longer than the tibiae, claws all similar, slender, with a small acute tooth at about the basal two-fifths. The entire inner edge of the claws is at first sight apparently unmodified, but under sufficient power is seen to be uniformly minutely pectinato-serrulate.

Described from two males from Eagle Pass, Texas, submitted by Mr. Warren Knaus. Type in the writer's collection, paratype in that of Mr. Knaus.

This species resembles in a general way *L. flavipennis*, but is of somewhat stouter form. The very long antennal club combined with the structure of the claws will distinguish it from any hitherto described species. The free angle of the hind coxae is not at all produced.

Macrobasis subglabra n. sp.

Form slender; entirely black; subglabrous; head and thorax sparsely finely punctate, elytra finely rugose, but not distinctly punctate. Head not widened toward the vertex; prothorax subquadrate with oblique front angles, dorsum with fine, feebly impressed median line. Antenae nearly as in *unicolor*, first joint not quite as long as the three following. Protibiae of male with two spurs. Length 7 to 10 mm.

Described from a series of ten specimens taken by Mr. F. S. Carr at Edmonton, Alberta, and a single example from Redvers, Saskatchewan, submitted by Mr. C. A. Frost. The type is an Edmonton male bearing date "9—VII—20."

This species is closely allied to *unicolor*, and with insufficient material might be suspected of being small, denuded specimens of the latter. Mr. Carr however, informs me that it is the commonest Meloide of his region, and that all examples are alike in appearance. Careful examination shows that there is a very fine, short, and sparse pubescence which is obscure in color on the disk, but a little paler near the margins. In *unicolor* the head is a little widened toward the vertex and therefore less quadrate than in the present species, the pubescence always distinct and dense enough to give a grayish aspect, the size averaging materially larger. The Le Conte collection contains two examples of this species from the Red River, placed with *unicolor*.

The types of all the above described species are contained in the author's collection; paratypes of *B. obtusidens* and *M. subglabra* in the Canadian National Collection.

LIST OF NATURAL ENEMIES OF THE CELERY LEAF-TYER (PHLYCTAENIA RUBIGALIS GUEN).[1]

BY F. H. CHITTENDEN,

U. S. Bureau of Entomology, Washington, D. C.

Having recently received the manuscripts of a paper on the celery leaf-tyer in its occurrence in California, the writer finds that the author, Mr. Roy. E. Campbell, Bureau of Entomology, has observed only two parasites in his State, and as several species are unrecorded, it seems advisable to bring together a list of these in one short paper, especially in view of the fact that at the time that the author's first paper on this leaf-tyer was published in Bulletin 27, Division of Entomology, in 1893, only a single enemy was known. All of the species which are here listed are parasites.

Synetaeris sp.—This ichneumonid was identified with its host in 1898 at Livonia, Pa. (Identification by Dr. Ashmead).

Pimplidea sanguineipes Cress.—This species was reared from the greenhouse leaf-tyer, February 15, 1916, by Mr. B. L. Boyden, Oxnard, Calif. (Determination by Mr. Cushman).

Rogas rufocoxalis Gahan—Reared in November 11, 1918, Alhambra, Calif., by Mr. R. E. Campbell. (Identified by Mr. A. B. Gahan).

Campoplex (Omorgus) phthorimaeae Cush.—Reared by Mr. Boyden at Oxnard, Calif., October 18, 1915. (Identified by Mr. A. B. Gahan).

Microgaster congregatiformis Vier.—Reared by Mr. Boyden at Oxnard, Calif., October 18, 1915. (Identified by Mr. A. B. Gahan).

Amorphota infesta Cress.—This ichneumonid fly (Chttn. No. 140802) was raised from its host February 10, 1909, from material collected by Messrs. McMillan and Marsh at Smeltzer, Cal. (Determination by Mr. Viereck).

Meloborus sp.—Reared from its host from material collected by Messrs. Marsh, September 18, 1908, at Oxnard, Calif. (Determination by Mr. Viereck.)

Chalcidid—An imperfect specimen of a chalcidid, reared by Mr. Boyden at Oxnard, Calif., February 10, 1916, not determined.

Tetrastichine (?)—A secondary parasite, bred on *Microgaster congregatiformis* Vier. as host by Mr. Boyden, Oxnard, Calif., February 15, 1916. (Identification by Mr. A. B. Gahan).

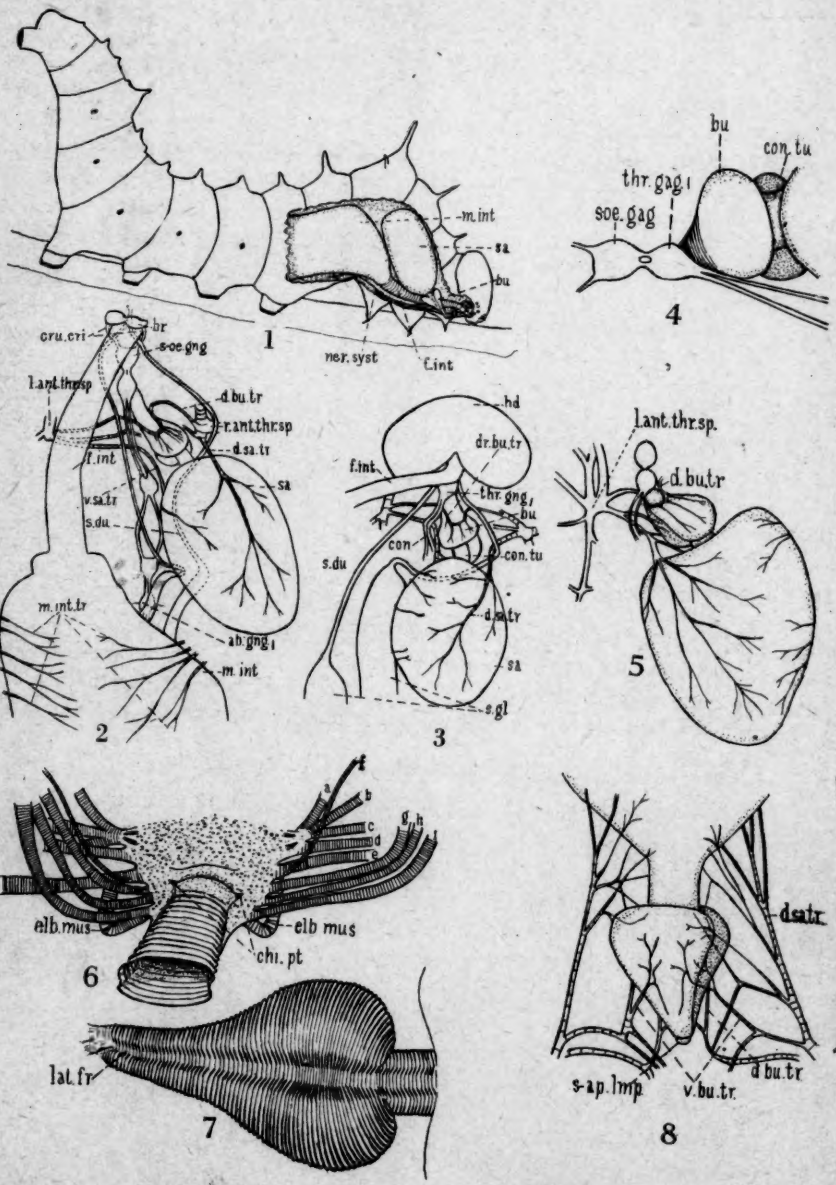
Trichogramma minutum Riley.—Reared by Mr. Boyden at Oxnard, Calif., March 14, 1916, as egg parasite. (Identified by Mr. A. A. Girault).

Syntomosphyrum modestus Houd.—An egg parasite raised by Mr. Boyden at Oxnard, Calif., March 14, 1916. (Identified by Mr. A. A. Girault).

Dibrachys boucheanus Ratz.—Reared by Mr. Boyden at Oxnard, Calif., February 10, 1916. (Identified by Mr. A. B. Gahan).

1—The American species, according to Mr. Carl Heinrich must be known by this name, *ferrugalis* Hbn., not occurring on this continent.

CAN. ENT. VOL. LIV. PLATE 3.



PROTHORACIC GLAND OF RED-HUMPED APPLE CATERPILLAR.

THE VENTRAL PROTHORACIC GLAND OF THE RED-HUMPED APPLE CATERPILLAR[1] (SCHIZURA CONCINNA SMITH & ABBOT).

BY J. D. DETWILER,

Western University, London, Ont.

In the summer of 1918 while engaged by Professor Herrick in making observation on *Schizura concinna,* my attention was attracted to the larva's power of ejecting a fluid from its body. A few experiments were made and the phenomenon presented such interesting phases that a somewhat detailed study of its general features was decided upon.

Nature and Source of Secretion.

The first experiment with the larva was a determination of the secretion's reaction towards litmus. A caterpillar was placed on strips of both red and blue litmus paper and mechanically irritated. A sudden reddening of the blue paper then took place showing plainly that the secretion was acidic. The ejection of the liquid was almost instantaneous, and being unacquainted with glands of this nature its source was not detected. An examination of the caterpillar's body revealed many small drops of liquid on its surface, suggesting as the source numerous hypodermal glands. A small sheet of blue litmus paper, was then notched and fitted over the caterpillar's body in the form of a yoke, so as to isolate or partition, one part of the body from the other. On irritating the caterpillar the paper was again reddened by the spray, but the body behind the paper partition remained dry. In this way the cephalic location of the gland was determined for, by close observation, after sufficiently disturbing the caterpillar, a fine spray of a clear liquid could be seen issuing from the ventro-cephalic region of the thorax. The odour of this secretion is very similar to that of vinegar and sufficiently strong to irritate the nasal passages.

Historical Sketch of Earlier Observations.

Comparatively few entomologists have noticed the occurrence of the secretion in this species, and only one localized its source.

The earliest record was made by Saunders of Canada, who in 1881 reported that when the larvae were handled they discharged from their bodies a transparent fluid of a strong acid odour. Six years later Denham observed that older larvae " had the power to emit quite a quantity of strong hydrochloric acid, strong enough to be decidedly corrosive to the skin and easily perceptible in the atmosphere." In 1895 Packard stated that while examining the very gaily colored and highly spined caterpillars, he observed that when a fully grown one was roughly seized with the forceps or fingers it sent out a shower of spray from each side of the prothoracic segment exactly like that of *Cerura* (*Harpyia*) *vinula.* In this article he also definitely credits himself with the discovery of the gland in this species. Foster in 1902 also noticed the secretion and described it

1—A preliminary paper was published in the Annals, Ent. Soc. Amer. (1919) in conjunction with Professor Herrick and entitled, "Notes on the Repugatorial Glands of Certain Notodontid Caterpillars."

as a transparent watery fluid with the odour of sulphuric acid, and further that it exuded from the caterpillar's body wherever it was touched. So far no records have been found where the gland was actually observed.

Range and Ejection of Spray.

The result of the litmus paper test suggested a very promising method of detecting the extent to which the liquid could be ejected. Large sheets of blue paper were fastened together covering in all a space of about eighteen by twenty-two inches. A caterpillar was then placed in the centre and irritated. Directly a graphic representation of the extent of the spray was registered for the strong acid readily reddened the blue paper[2]. In this way it was found that the caterpillar could spray a considerable area at one operation, and that it appeared to have some directing sense and power. The most normal action, however, seems to be that of sending the spray backward over its body,—a natural direction since it is here that it is most likely to be attacked. Some idea of the area covered may be formed from the fact that a caterpillar has been observed by the writer to send the jet a distance of eight inches and also that the spray tends to spread out very considerably. The act of ejecting the liquid is quite characteristic and gives the caterpillar a somewhat formidable appearance. When strong mechanical irritation is applied,, for example, the head is thrown up, jerked to one side and a jet of clear liquid emitted through a small tongue-like organ momentarily protruded from the mid-ventral region of the neck. The ejection of fluid is almost instantaneous, resembling very much the emptying of a pipette when the rubber bulb is suddenly and forcibly squeezed.

General Form and Location of Gland.

The gland consists essentially of two divisions arranged in tandem and connected by a short tube. The anterior part is bulbous and relatively small, while the posterior one is sack-like and large[3] (fig. 1). The anterior and apical part of the bulb is connected by a short "false duct" to the external opening which is located in a ventro-medial position just behind the anterior margin of the prothoracic segment. The sack extends backward to the posterior border of the metathorax and rests to a large extent on the flattened anterior portion of the much enlarged mid-intestine. It will thus be seen that the whole organ passes somewhat diagonally through the entire length of the thorax and also that it occupies the major part of the space in this region of the body.

Position of Gland in Relation to Other Organs.

Normally, in insect anatomy, one finds that the oesophagus, after coming up through the nerve collar, passes backward in a medial direction to the mid-intestine. In this case, however, it is pushed to one side, usually to the left to make room for the gland which also arises in the middle line. This displacement

2—The article referred to in the previous foot-note describes a series of experiments subsequently carried out by this method and also a diagram of the actual range of the spray.

3—For convenience these two divisions will be referred to as "bulb" and "sack" respectively, it being understood that the terms are not necessarily significant of their functions.

may be so great as to radically change the symmetry of the intestinal tract here, causing the fore-intestine to connect with the mid-intestine considerably to one side (fig. 2.). In fact the junction has been observed to be so far to the left that the fore-intestine was quite in line with the left half of the mid-intestine.

The silk glands also suffer considerable displacement. Normally, one would expect to find them on their respective sides of the body since their ducts do not connect until they have passed the gland in front. But in *S. concinna* this is not their usual position, for both appear, as a rule, on the left side, their ducts passing forward on the same side until the vicinity of the bulb has been reached. This condition, however, may be reversed. When they are both on the same side the duct of the displaced gland in passing over to its proper side, before uniting with its fellow to form the single duct in front, usually keeps characteristically clear of the bulb (figs. 2 and 3). In only two instances has this duct been noticed passing across the front of the bulb. In one of these instances the glands were both on their respective sides of the body but the duct of the right gland on reaching the bulb passed to the left of it and then back again to the right side across the front of the bulb.

Even the nervous system may be forced to deviate from its mid-ventral course or even to modify its symmetry. In the first place the bulb, as it comes up from beneath the suboesophageal ganglion, tends to push the connectives to one side[4], almost invariably to the left[5] (fig. 2), and secondly, the prothoracic ganglion itself may be considerably distorted, its apex turned toward the left, due to the medial position of the bulb (fig. 4).

One can readily understand why the oesophagus, and to some extent also the nervous system, should give way to such a large organ tending to occupy the same position. It is difficult, however, to understand the shifting of the silk glands to the same side, thus necessitating a circuitous course of the duct in order to return to its normal position. Possibly a study of the development of the larva would explain this. From the varied positions that this gland may occupy with respect to the other organs, it appears to have reached an abnormal degree of development in this species.

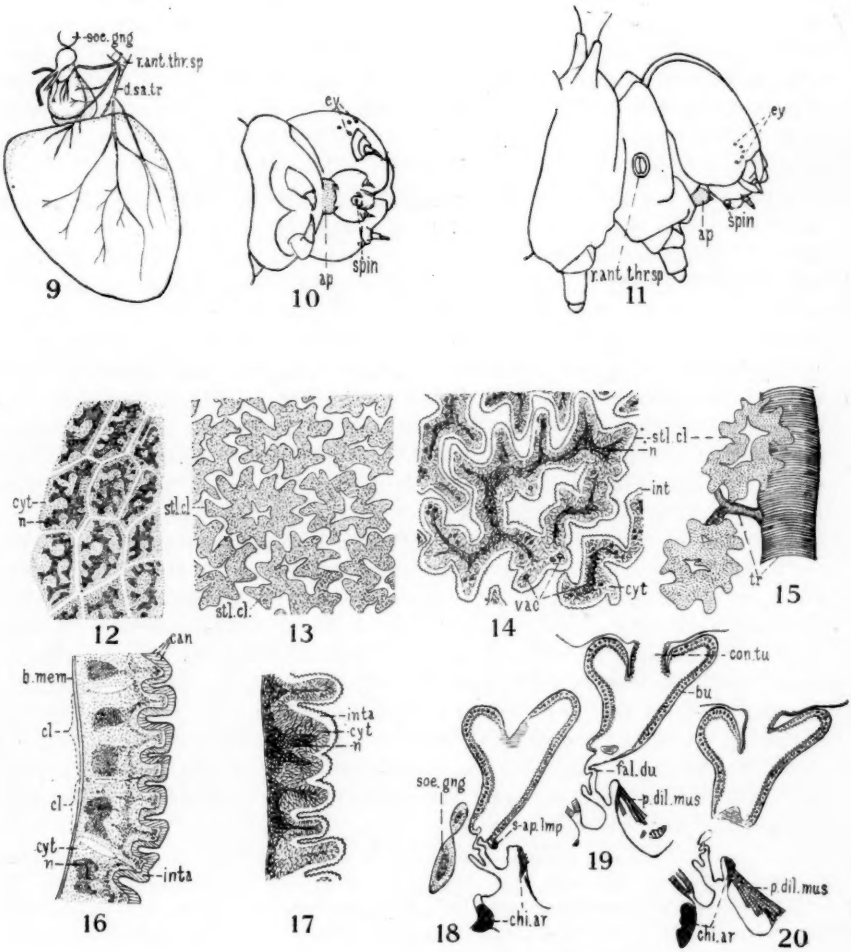
Tracheation.

The whole gland receives its oxygen supply from the anterior pair of thoracic spiracles. Two rather prominent branches, one from each side, issue from the mass of tracheae here and pass inward to the sack. On reaching it one branch goes to the dorsal surface and subdivides there while the other passes to the ventral half. On the principle of bilateral symmetry one would expect each branch to supply its respective lateral half. Almost invariably, however, the branch from the right side goes to the upper surface and the left one to the lower (figs. 2 and 3). In only one instance has this condition been found to be reversed. These two main branches may also contribute to the tracheal supply of the upper part of the bulb (fig. 8).

4—Dimmock, A. K. 1882, noticed a similar displacement in the cords of *Harpyia vinula* (an European species) and stated that it is more pronounced in the earlier stages. I have not investigated this phase of the problem in *S. concinna.*

5—As I recall, there was one instance where the cords passed the gland on the right.

CAN. ENT. VOL. LIV. PLATE 4.



PROTHORACIC GLAND OF RED-HUMPED APPLE CATERPILLAR.

The bulb receives its main supply from two pairs of branches, one pair going to the dorsal[6] surface and the other to the ventral. The former pair is somewhat interesting from the fact that it forms a continuous circuit across the dorsal surface of the bulb, making a broad loop here from which it sends off branches. In this way a continuous trachea passes from one side of the thorax to the other (fig. 2 d. bu. tr.). In some larvae the middle part of the loop is weakened and the branches come off in two main groups, but this grouping may also occur where there is no weakening of the loop (fig. 2). This condition is probably reminiscent of a time when each branch supplied its own side independently. The pair going to the ventral surface does not make a medial connection but each branch keeps to its own half, where it divides and subdivides normally (fig. 8).

From this it will be seen that each division of the gland is well supplied with tracheae, a provision quite significant when the function of each is considered. The tracheae also, very probably, perform a partial suspensorial function, there being no muscular attachment over the whole gland except at its anterior extremity. This accessory function may, in fact, have given rise to the continuous loop over the dorsal wall of the bulb. As to the peculiar disposition of the tracheae going to the sack, in which one branch or trunk supplies the dorsal half and the other the ventral, it seems reasonable to suppose that each does normally supply its own lateral half but that as a result of an extraordinary development of the gland, the sack has turned or fallen over to one side, the direction being almost invariably to the left. In fact this turning does not appear to have been quite complete, for the plane dividing the tracheated halves is not perfectly horizontal but inclines a little to one side, that is, to the right (fig. 3), showing that the leftward orientation is imperfect; nor does the direction of falling appear to be permanently established for, as noted above, the usual disposition of the right and left tracheal branches over the sack may be reversed. This theory of turning, due to extraordinary development, can, no doubt, be checked up by embryological studies, or perhaps even by examining the early-stage larvae. In support of the theory it might be stated that the writer has discovered homologous glands in a few species of the genus *Datana*, also Notodontids, in which the structures were so small that the elasticity of their own tissues would no doubt hold them in place. Their tracheation has, however, not been studied[7].

6—Although the bulb naturally stands more or less erect it will be considered, for descriptive convenience, as lying on the ventral body-wall and the antero-dorsal surface will be referred to as the dorsal surface. A similar consideration will apply to the other aspects of the bulb.

7—In dissecting a number of Datanas (*D. ministra*, *D. contracta*, *D. integerrima* and *D. angusii*) I found that they too possessed glands somewhat similar to that of *S. concinna*, but evidently very much simpler in structure. In testing the contents of the gland of *D. integerrima* it also was found to be acidic. I might here add that I also experimented with *Schizura unicornis* and found that it secreted an acid fluid and that the operation of the gland is practically the same as that of *S. concinna*. I have found no other record of ventral prothoracic glands in these species.

Musculature.

The musculature of the gland is somewhat remarkable in that it is wholly situated at its anterior end. As the individual muscles are small and close together, they can be studied best by pulling the gland backward so as to stretch this area, thus separating the muscles more or less[8]. When this is done they will be seen to be arranged in pairs (a muscle on one side having its corresponding muscle on the other) along the lateral margin of the organ beginning at the extreme cephalic end of the "false duct" and extending back a short distance beyond the apex of the bulb (fig. 6). At the extreme cephalic end of the "false duct" and just inside of the ventral body wall, there will be seen three pairs of muscles (fig. 6, a, b, c,) radiating from the ends of the transverse slit which constitutes the external opening. The anterior pair extends to the caudal margin of the head while the other two pairs pass laterad to the body-wall being attached close to the first pair of thoracic spiracles (fig. 11), one in front and the other below. Close to these muscles and appearing almost as lateral extensions of the duct is another pair (fig. 6, d). These are short and have their origin in the body-wall at a point about half way between the duct and the anterior spiracles. A short distance behind these and still in alignment with the lateral margin of the duct the fifth pair is inserted (fig. 6. e); these also extend to the body-wall, their origin being below and close to the spiracles just mentioned. From the point of insertion of each of these last mentioned muscles there arises a very slender muscle (fig. 6, f), the pair passing upward and outward to their origin on the caudal margin of the head. Accompanying this pair of muscles are three other pairs inserted one behind the other along the lateral margin of the apex of the bulb (fig. 6, g, h, i) and originating in the same area as the slender ones just mentioned. One pair still remains to be described (fig. 6, elb. mus.). They are characteristically elbowed and can be seen to good advantage when the gland is thrown forward. They will then appear as two miniature columns passing upward from the ventral body-wall, just behind and a little to each side of the apex of the bulb, and attached directly below the insertion of the most posterior of the three pairs of muscles just described. A short distance from their insertion they make a sharp bend (elbow) and pass downward to their origin close to and behind the posterior margin of the external opening. From this point they pass backward in their attachment along the body-wall to the ridge separating the first and second thoracic segments. They also appear to be more or less continuous with other ventral body-muscles. From the ventral position of these muscles it will be seen that they must be capable of relatively great extension when the head is thrown upward and the apex of bulb is forced forward. Their elbowed condition is then evidently nature's most convenient way of accommodating their length to the short space resulting when the caterpillar is undisturbed.

Morphology.

As mentioned before, the gland proper consists of two distinct divisions, one bulbous and the other saccular. The former is more or less pear-shaped

8—It will be necessary to first dissect away the mass of body muscles and tracheae that occupy this region of the thorax.

and distinctly bilobed at its larger end. This is due to two well defined lateral furrows, one on each side, which externally divide this structure into dorsal and ventral halves. These furrows not only traverse the whole length of the bulb, but also that of the short tube connecting the two divisions (fig. 7). The narrow apical end of the bulb widens somewhat laterally, and its walls show a dorsal and ventral pair of darkened areas, which are evidently heavily chitinized points for attachment of the muscles which were found inserted in this region (fig. 6, chi. pt.). The lumen of the bulb here also shows the lateral widening, the whole space ending rather abruptly, due to the truncated terminus of the bulb. In this somewhat abrupt terminal wall can be seen the true opening of the glands which consists in a transverse slit with whitened lips. It is called the "true" opening since it is this part of the gland that is protruded through the body-wall opening when the liquid is ejected. When thus protruded, two small, finger-like projections arise from the lateral angles of the anterior margin of the apex (figs. 10 and 11). These fold towards each other when the apex is withdrawn. On the ventral side of the apex is a small, median lump-like structure (figs. 8 and 18, s-ap. lmp.), which is white in color and by transmitted light appears to be hollow. Its white color contrasts rather strongly with the distinct yellow of the bulb.

Connecting the end of the bulb with the external opening is a short tube, which has been referred to as a "false duct," and which is really an infolding of the body-wall. This invagination of the body-wall evaginates when the apex of the bulb is forced out through the external opening. It is thus seen that the gland itself is not evaginable, but only the false duct. The anterior end of the false duct terminates with the more or less chitinized lips of the external opening. The anterior lip of this opening appears as a rather loose fold while the posterior one is thinner and discloses a small chamber when drawn back so as to separate the lips.

The form of the saccular division is best described by the name given, for it looks indeed like a sack. It is somewhat oblong, evidently favouring an ovoidal shape with the larger end nearer the bulb. Its shape, size and very white color, contrast strongly with the bulb.

Dimensions.

In order to form a more concrete idea of the size and relative proportions of the gland, a few of the more important dimensions will be given. In the dissections only final stage larvae were taken, and even here the measurements vary much, for during the instar very considerable growth takes place. In one dissection, the dimensions were as follows: total length of gland 6.5mm., length of sack 4.33 mm., width of sack 3.6 mm., and length of bulb 2.17 mm.[9] This was the largest gland of which a measurement was taken. In another dissection, the total gland in situ, occupied a space of 4.5 mm. in length. The apical end of the bulb narrows decidedly. Some idea of its size may be formed from measurements made of the part when extruded. In two caterpillars

9—Computed from drawing made to scale. In this case the connecting tube was concealed by the dorsal lobe of the bulb and hence no measurement is given for it.

these averaged approximately as follows: length 0.39 mm., width at tip 0.57 mm., width at base 0.82 mm.

From the size of the apex it will be apparent that the muscles concentrated there must be very small. The three pairs at the ends of the transverse, body-wall slit average approximately 0.026 mm. in cross-section, and they are relatively quite heavy. The slender ones mentioned in the discussion of the musculature are about 0.008 mm. in diameter. They are the lightest of the muscles connected with the gland.

Histology.

The hypodermal origin of the gland is very plainly shown in its histological structure. Lining the whole organ is the highly developed intima, which is so strong that the layer of overlying cells may be quite readily stripped off, leaving a well-formed skeleton of the whole organ.

In the bulb and connecting tube, this lining presents a strongly corrugated appearance, the corrugations running crosswise around these parts throughout their entire length. These, as in the case with the taenidia of the tracheae, may be pulled off in spiral rings. At the lateral margins, where the longitudinal furrows occur, these rings bend inward and appear to be less highly developed. The whole structure, however, is so strong that it tends to hold these parts of the gland open at all times. This rigidity is evidently due to the corrugations, and not to any particular thickenings, for in cross-section no such thickenings are seen (fig. 16). Close examination of the intima here reveals many fine canals (canaliculi) extending through it which evidently are outlets for fluids secreted by the overlying cells.

The intima of the sack is not reinforced by ring-like corrugations, but is flabby, and collapses when the secretion is drained out. It has, however, a very irregular surface, the inequalities having a wavy appearance. Besides the small inequalities, a still closer examination of the intima shows the surface to be covered with what appear to be very many closely-placed, minute pits. These, too, are probably pores for the liberation of secretions into the lumen. In cross section (fig. 17) or in a lateral view, which may be easily obtained, due to the irregularities of the surface, these pits show as small crinkles or even as fine chains.

The cells over-lying the bulb are distinctly yellow in color, relatively large, and polygonal in outline. In tangential section they show very large, many-branched, single nuclei (fig. 12). The whole content is granular, the granules of the cytoplasm being finer than those of the nucleus. In permanently prepared slides, a clear border is seen to surround the nuclei which may be an artifact. In a few measurements made, the average dimensions of the cells were 0.082 mm. long by 0.043 mm. wide. When the bulb is sectioned longitudinally so as to cut the corrugations cross-wise, it will be seen that the thickness of the wall is mainly due to these secretory cells (fig. 16). The heavier parts of the wall attain a depth of 0.06 mm., the corrugations dipping into the cellular tissue for about one-third of the depth. It will also be seen that the cells project up into the loops or corrugations of the intima. The canaliculi

mentioned before may be distinctly seen radiating through the intima surrounding these finger-like projections. In these sections there may be found cells appearing to have more than one nucleus. This, it will be understood, is due to the branched nuclei cut in more than one place.

In the small, ventral white lump at the apical end of the bulb, the cells appear long and club-shaped, and their contents rather coarsely granular. A closer study will likely show that they are spindle-shaped, in this way forming a wall of a bulb; no chitin, however, can be seen extending into this structure.

In the sack, the corresponding cells present most interesting features. From a surface view, they resemble very small white stars[10], or cog-wheels, the cogs interlocking. This is particularly evident when the tissue is stretched so as to separate them somewhat. Thinking of them in three dimensions, one may regard them as irregular, cup-like forms embedded in the intima, and resting with the larger base on the basement membrane,—the cup being irregularly perforated along its longitudinal diameter. The difference in size between the two ends of the cup may be experimentally determined by removing the intima and focusing down on the cells as they rest against the basement membrane. The cogs, so to speak, will then be seen to become longer and longer as their distal ends come into view. In this way the diameter of a number of cells has been found to have an average increase of about 0.012 mm. These cells are shown in outline in fig. 13, and, as the intima was removed, the clear spaces between them and through them will give an idea of the pattern found on the intima which was referred to above as being wavy. By staining with Mayer's haematoxylin the cell structure was found to be a mass of very fine reticulations, and between the meshes small vacuoles were frequently observed (fig. 14). The nuclei are also many branched, the branches extending into the cogs of the cells. As a matter of fact the nuclei appear to consist largely of heavier reticulations which thus stain heavily. In cross-section it will be seen that these reticulations sometimes take an arborescent form. The apparently continuous nuclear structure in cross-section is due to interlocking cells having been sectioned together. Here, too, it will be seen that the wall of the sack is largely composed of cell tissue, the intima being thin and folding down into the cells.

The thickness of the gland-wall here is approximately 0.04 mm., and as the stellate cells project up into the undulations, this is at the same time practically the depth of the cell. In a number of measurements made the longitudinal diameter of these cells averaged 0.09 mm.

Incidentally the tracheal supply to a few individual stellate cells was also noticed (fig. 15). As each cell is evidently isolated by the intima passing around and through it, it must have its separate oxygen supply. From the diagram it appears that a few tracheae may go to the same cell. The problem of cell aeration, however, has not been studied.

The histology of the connecting tube favors that of the bulb, while that of the false duct is similar to that of the body-wall.

From this discussion it will be seen that both parts of the gland are evidently secretory in function. It is possible that most of the flushing mater-

10—On this account I have called them stellate cells.

ial is secreted by the sack, and the stronger and more irritating ingredients by the bulb. The very large nuclei would tend to indicate a high metabolism in proportion to the volume of cell tissue.

Composition of the Secretion.

Through the kindness of Professor Chamot of the Department of Chemistry at Cornell an attempt was made to determine the composition of the gland contents. By the use of chloroform it was not very difficult to anaesthetize a number of caterpillars without disturbing them sufficiently to cause ejection of the secretion. The glands were then removed in toto, the sacks opened and the contents allowed to drain out. This liquid was then fractionally distilled in a microchemical distilling bulb.

A white crystaline solid condensed on the receiver immersed in a freezing mixture. This was tested for formic acid by the usual methods, viz: the formation of lead, silver and copper formate crystals. These were found to be morphologically the same as those obtained from pure formic acid and also to behave similarly under the polarizing microscope. In the liquid state this condensate is very acrid and volatile, has the odour of formic acid with the characteristic behaviour in a wet test. There were some indications of traces of acetic acid but these were so unsatisfactory that its presence is doubted. If it is present, it is in traces only. In addition there is reason to believe that a very small amount of a more volatile, acrid and irritating substance than formic acid is present, but its nature has not yet been ascertained. This substance appears in the first fractions, is exceedingly irritating and attacks the mucous membrane of the eyes, nose and mouth.

There remains in the bulb of the distilling tube a non-volatile residue, more or less viscous, in which certain components are precipitated as a flocculent deposit by heat. No examination has been made of these non-volatile components.

It might be mentioned that if a further analytical study of the secretion is carried out an attempt will be made to isolate the contents of the bulb and the sack, for as seen by the histological study, these parts have very different secretory cells.

Mechanism.

As there are no muscles connected with the gland proper except at the apex of the bulb, it is quite evident that the force necessary to cause the protrusion of the apex and the ejection of the fluid must be derived from outlying muscles. These have not been studied but no doubt the protrusion is brought about by a general thoracic pressure, while the ejection is caused by a particular dorso-ventral pressure on the bulb. That this particular force must come into play is quite evident from the structure of this part, for the lateral furrows with their incurved corrugations act like springs and the whole organ works like a bellows. This may be easily demonstrated after the bulb has been dissected out, for on pressing the dorsal and ventral halves together they spring back when this pressure is relieved. It might be argued that the whole gland is under pressure and that this forces the liquid out. It probably is all under pressure, but it is not reasonable to believe that so flaccid a receptacle as the sack lying in so large and irregular a space, could be responsible for the short,

quick squirts. Besides the caterpillar may eject a number of sprays in succession; hence there likely are small, more or less definitely proportioned, quantities sent out such as the bulb might hold. It might also be argued that the pressure on the bulb would force the liquid back into the sack. The backward flow is evidently prevented by the lateral furrows being sufficiently wide to allow enough appression of the dorsal and ventral halves of the bulb and connecting tube to bring the internal margin of the two halves together (fig. 19), cutting off the backward escape. In this will be seen the necessity of the extension of the furrows through the connecting tube (fig. 7). This pressure on the bulb may be partly effected when the caterpillar throws its head back at the time it ejects the fluid. It is possible that the quantity of liquid ejected may be secondarily controlled by the action of the valves at the end of the bulb and at the end of the false duct. However, since the apex projects out through and beyond the body-wall when the gland is in action it is not likely that the lateral muscles described as arising here, function in closing this valve, for they would then tend to draw the apex back into the body. The opening in the body-wall may, however, function in shutting off the spray. When the apex is protruded, the slit-like opening assumes the shape of a square, and, as relatively powerful muscles radiate from the lateral ends when in a normal position, these may in the distended form, act as strong lateral extensors tending to pinch the walls of the apex together. In addition the small median lump, referred to above, may be pushed like a plug into the lumen, assisting the cutoff. It might be argued that this lump would normally tend to close the lumen even when these lateral muscles were not particularly tightened. To overcome this action a median muscle extending from the posterior lip of the opening to the ventral body-wall would become necessary. No such muscle was noticed in the dissections but in looking over sections of this part of the body a muscle has been found (figs.[11] 19 and 20, p. dil. mus.) which may possibly function as such, although it is evidently not attached to the lip. By contraction of this muscle, granted that the above conjectured function is correct, the lumen of the apex would at once be opened, due to the release of pressure both on the plug and on the elastic, chitinized wall of the apex. By the action of this muscle, too, the lateral muscles from the external opening could be used in helping to direct the apex from side to side, without cutting off the escape of the liquid.

The function of the other paired muscles can be quite readily deduced when the conditions after extrusion of the apex are considered. The lateral muscles no doubt assist in drawing the apex from side to side. Those passing from the apex to the dorsal margin of the head naturally function as retractors of the apex. As the apex must also be drawn backward by a horizontal force, the two "elbowed muscles" would naturally come into play and thus the combined upward and backward forces would result in the passage of the bulb diagonally back into its normal position.

The finger-like projections mentioned as arising from the anterior extremity of the protuded apex may possibly aid in the backward direction of the spray. This function is, however, merely a supposition.

11—As the longitudinal axis of the bulb was not in perfect alignment with the knife, three of the series of the sections have been included for the sake of clearness.

Function of the Gland.

There may be two functions, the one defensive and the other protective. As to the former there can be little doubt, for it is not likely that a sparrow or any other small predaceous enemy would repeat an attack on the caterpillar after receiving a quantity of the highly irritating secretion in its eyes or mouth. Besides, if the gland were not defensive, it is not probable that the caterpillar would have acquired such dexterity in its repugnatorial use. It might be mentioned, however, that the defence against parasite enemies is inadequate, judging from the high degree to which the larvae are parasitised. The problem of the possible second function has not been well worked out. If it obtains, it is very important, for then it forms a necessary factor in the life of the species. It will be recalled that this species hibernates as a caterpillar, descending from the trees in the late summer and in the fall and spinning a cocoon near the surface of the ground. It is thus considerably exposed to rains, frost, and all the rigors of the seasons following. This exposure presupposes a well developed means of protection and one would naturally look to the cocoons for it. If one of them be examined it will be found to be parchment-like, simulating a piece of clear mica. It evidently becomes waterproof, in fact, one has been observed to hold a liquid for a longtime. The question of the second function then has to do with the making of the cocoon and an investigation of the problem was suggested by work done in Europe by Poulton and Latter on *Dicranura vinula*. Poulton (1886) found that a freshly made cocoon, while still damp gave an acidic reaction while Latter (1897) showed that the formic acid secreted by the larva was utilized, not only for defensive purposes during larval life, but also for giving a special character to the silk of the cocoon, whereby it became extremely tenacious to any foreign substance brought in contact with it and also extraordinarily hard, waterproof and completely closed against all aggressors. It is doubtful if this takes place in the species under consideration. On examining a piece of the cocoon under the polarizing microscope there was found what appeared to be strands of silk having much the same relative position and shape as would be expected from the way in which a cocoon is spun. When examined with a dark-field illuminator, a somewhat similar pattern was observed. This evidence, then, would lead to the belief that if there is a secondary substance employed in making the walls of the cocoon homogeneous it must act as a kind of gum or varnish, so to speak, to fill in the interstices. If this is the case, then the index of refraction of the gum is so nearly that of the strands as to practically cause both to disappear together. If the acid has a solvent effect, as Latter seems to show, both it and the silk would have to be sent out at the same time[12], for it is not at all likely that the caterpillar can secrete any fluid strong enough to act chemically on the once exposed silk. In watching a caterpillar spin on a glass plate nothing extraordinary seemed to occur in the matter of spinning, but there was some coalescence of the fibres where they came into contact. Possibly if the spinning had been continued until the meshes had become sufficiently small total coalescence would have taken place, pro-

12—Note in figure 10 and 11 how conveniently the extruded apex is situated with regard to the spinneret.

ducing a homogeneous wall. However, microscopic examination of the glass does not show peculiar local running or spreading of the silk.

Working on the supposition that there is an interstital gum present, it might be added that attempts to mount the parchment in a medium of such a refractive index as to eliminate the gum were not wholly successful, and further, that no attempts were made to dissolve out the gum.

Summary.

In conclusion it is evident that this structure must be included in the category of defensive glands among insects. More particularly, it belongs to a group of glands discussed by Berlese under the heading, *"Ventral of the Prothorax or Jugular Ventral."* For the want of a more specific name the former designation has been retained for the gland under discussion,—a name not inappropriate since the structure possibly arose from simple ventral thoracic invaginations in which the prothoracic one has been rather generally retained in the Lepidoptera[13]. This ventral prothoracic gland, in fact, occurs as a rather simple structure in *Hyponomeuta malinella*, an isolated and primitive genus of the Tineids (Berlese 1909). In the study of the morphology, histology and mechanism of this gland one must conclude that it is a very highly developed and specialized structure. Its efficiency in defence seems to be anticipated in the development of the larva, for the mature caterpillar assumes very marked warning attributes with its red head and prominent, red, spiny hump. In this highly developed and efficient form one might be influenced to believe that the complex gland phylogenet ically antedates the simple ones, but when one recalls the irregularities of its position with respect to the other organs of the thorax, the peculiar tracheation and the seeming obtrusiveness of its position, one must conclude that the evidence rather supports the contrary view. As to its possessing a protective fluid little can as yet be said beyond the fact that the nature of the cocoon tends to support the view.

ACKNOWLEDGMENTS

Special acknowledgments are due Dr. E. M. Chamot, Professor of Chemical Microscopy and Sanitary Chemistry at Cornell, who not only made chemical analyses of the secretion, but also rendered valuable further assistance by his interest in the problem as a whole. The writer also wishes to express his gratitude for helpful suggestions given by members of the Entomological staff.

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13—For a general discussion of these glands see Dimmock (1882), Packared (1890) and Latter (1887). These authors also give references to literature while Packard (1896) devotes a paper entirely to literature on eversible glands. A very excellent study of the secretion of *C. vinula* is given by Poulton (1887), the gland having been well described by Klemensiewicz (1882). See also Berlese (1909).

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ABBREVIATIONS

a, b, c, d, e, f, g, h, i, ...	see text under "Musculature"
ab. gng. 1, ...	first abdominal ganglior
ap., ...	apex
br., ...	brain
bu., ...	bulb of gland
b. mem., ...	basement membrane
can., ...	canaliculi
chi. pt., ...	chitinized point
chi. ar., ...	chitinized area
con., ...	connective
con. tu., ...	connecting tube
cru. cer., ...	cruri cerebri
cyt., ...	cytoplasm
d. bu. tr., ...	trachea to dorsum of bulb
d. sa. tr., ...	trachea to dorsum of sack
ey., ...	eyes
elb. mus., ...	elbowed muscle
f. int., ...	fore-intestine
fal. du., ...	false duct
hd., ...	head
inta., ...	intima
l. ant. thr. sp., ...	left anterior thoracic spiracle (region of)

lat. fr., ... lateral furrow
m. int., ... mid-intestine
m. int. tr., ... mid-intestinal trachea
n. ..... nucleus
ner. syst., ... nervous system
p. dil. mus., ... posterior dilator muscle
r. ant. thr. sp., ... right anterior thoracic spiracle (region of except in figure 10)
sa., ... sack of gland
s. du., ... silk duct
s. gl., ... silk gland
stl. cl., ... stellate cell
s-ap. lmp., ... sub-apical lump
s-oe. gng., ... suboesophageal ganglion
spin., ... spinneret
thr. gng. 1, ... prothoracic ganglion
thr. gng. 2, ... mesothoracic ganglion
thr. gng. 3, ... metathoracic ganglion
tr., ... trachea
v. but. tr., ... trachea to venter of bulb
v. sa. tr., ... trachea to venter of sack
vac., ... vacuole

Explanation of Plates.

Plate 3.

Fig. 1. Final stage caterpillar of *S. concinna* in a natural feeding posture; internal organs somewhat diagrammatically illustrated; actual length about 1.25 in.

Fig. 2. Dissection of organs in anterior part of body, dorsal aspect.

Fig. 3. Dissection of organs in anterior part of body, dorsal aspect; oesophagus turned to left and other organs in normal position.

Fig. 4. Dorsal aspect of suboesophageal, and prothoracic ganglia, and postero-lateral view of bulb and connecting tube.

Fig. 5. Sack turned on its right side.

Fig. 6. Musculature, dorsal aspect, including corrugated apical end of bulb; anterior part showing muscles "a", "b" and "c" somewhat diagrammatically illustrated.

Fig. 7. Lateral aspect of bulb and connecting tube showing only corrugated lining (intima).

Fig. 8. Latero-ventral aspect of bulb, connecting tube, lower part of sack and sub-apical lump (gland thrown forward).

Plate 4.

Fig. 9. Normal position of gland figured in number 8.

Fig. 10. Ventral view of anterior part of caterpillar.

Fig. 11. Lateral view of anterior part of caterpillar.

Fig. 12. Tangential section of bulb wall showing the over-lying secretory cells.

Fig. 13. Stellate cells, the intima removed, and the cells standing on the basement membrane when drawn.

Fig. 14. Tangential section of sack wall showing stellate cell.

Fig. 15. Tracheal supply to stellate cells.

Fig. 16. Cross-section cells and corrugated intima of bulb.

Fig. 17. Cross-section cells and undulated intima of sack.

Figs. 18, 19, and 20. Saggital sections of the bulb in the regions of the connecting tube and false duct.

NOTES AND CORRECTIONS. (SYRPHIDAE, DIPTERA)

BY C. HOWARD CURRAN,

Orillia, Ontario.

For *Chilosia rita* new species, Can. Ent., Vol. LIV, page 70, read *Chilosia ontario* new species.

For *Chilosia columbiae* new species, l. c., page 69, read *Chilosia robusta* Hine.

Prof. Hine's description of what is undoubtedly the same species was published in the March number of the Ohio Journal of Science, page 144, based on specimens from Alaska. I did not become aware of the description of this species until too late to change the name. I have also seen specimens from Washington State. The species is very close to *aldrichi* Hunter.

Chilosia orilliaensis occurs also in New Brunswick and I have six specimens from the vicinity of Fredericton.

Syrphus rectoides Curran may be very readily distinguished from *S. genualis* Williston by the fact that the latter has complete transverse black fasciae on the venter in both sexes, while the former has a median row of fuscous spots in the female and in the male these spots are more like those of *S. ribesii* L. The female of the former may be distinguished from the female of *S. insolitus* Osburn by the narrower facial stripe which stops well before the antennae.

Melanostoma chilosia Curran: A female specimen from Mount Ranier, Washington, collected by Prof. A. L. Melander agrees almost perfectly with the type from Banff, Alberta, but the pile appears to be slightly longer. This species is close to *M.* (*Chilosia*) *parva* Williston, but the facial tubercle is more prominent and the legs are chiefly black, whereas in *parva* the legs are almost all reddish, except the bases of the femora.

Melanostoma lata; vol. LIII, p. 276, second paragraph, line 11, for "a broad crossband on the posterior half"; read "..... on the anterior half."

CHANGE OF NAMES IN CICINDELA.

Dr. Walter Horn of Berlin informs me that two of the names recently proposed in the March number of this journal, viz: *azurea* and *elegans*, are preoccupied. This necessitates a renaming as follows:—

C. azurea is changed to *C. wallisi.*

C. elegans is changed to *C. westbournei.* E. E. Calder.

A NEW FORM OF SATURNIID FROM MISSISSIPPI AND FLORIDA (LEPIDOPTERA)

BY F. H. BENJAMIN,
Agricultural College, Mississippi.

Tropaea luna race **dictynna,** spring form **mariae,** form nov.

The exact status of *dictynna* being questionable the author prefers to temporarily consider it the Gulf Strip race of *T. luna.* It is, however, to be born in mind that the wing shape is entirely different from *luna,* and that the cocoon is much larger. It is entirely possible that *T. dictynna* may be a valid species. The so called northern examples of *dictynna* seen by the author while possessing the stripe on the wings, always found in true *dictynna* to the best of his knowledge, have a wing shape similar to true *luna.*

The spring form of *dictynna,* herein described, occupies the same relative position in relation to the normal form that *rubromarginata* Davis occupies in relation to true *luna.* The wing shape of *mariae* is similar to *dictynna,* but the tails are longer, in this respect approaching *luna.* The dark stripes of *dictynna* are present across both pair of wings. Outer borders a beautiful deep reddish-lavender, with violaceous-blue bordering this internally. In this respect similar to *rubromarginata.* Abdomen pure white with a lateral violaceous stripe. Sexes similar.

Type Locality and Number and Sexes of Types: Holotype ♀, Ocean Springs, Mississippi, March 20th, (Collector, R. P. Barnhart, Inspector, State Plant Board); Allotype ♂, Agricultural College, Mississippi, May 1st (G. F. Arnold, Assistant Entomologist in Charge of Quarantine Department, State Plant Board); Paratype ♂, March 9th, Agricultural College, Mississippi (from student collections); Paratype ♀, St. Petersburg, Florida, April 21st (collection of Dr. William Barnes).

Types. Holotype ♀, deposited as loan material in the collection of Dr. William Barnes; Allotype ♂ and Paratype ♂, collection of Agricultural College, Mississippi; Paratype ♀ (St. Petersburg specimen), collection of Dr. William Barnes.

Named by the author in respect to his wife, in remembrance of the many inconveniences suffered without complaint in frequent collecting trips in Mississippi.

ANNUAL MEETING.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Entomological Society of Ontario will be held at the Ontario Agricultural College, Guelph, on Friday and Saturday, November the 24th and 25th. Members are requested to send at once, to the secretary, the titles of papers which they will present at the meeting, stating the time required for each. A successful meeting is expected and all members are urged to make a special effort to be present.

A. W. Baker, O. A. College, Guelph, Ont. — Secretary

F. J. A. Morris, Peterborough, Ont. — President

Mailed Thursday, November 23rd 1922.